1-5 Inverse Functions and Parametric Equations

The photograph shows a highway crew painting a center stripe. From records of previous work the crew has done, it is possible to predict how much of the stripe the crew will have painted at any time during a normal eight-hour shift. It may also be possible to tell how long the crew has been working by how much stripe has been painted. The input for the distance function is time, and the input for the time function is distance.

If a new relation is formed by interchanging the input and output variables in a given relation, the two relations are called *inverses* of each other. If both relations turn out to be functions, they are called **inverse functions.** If not, the relation and its inverse can still be plotted easily using **parametric equations** in which both x and y are functions of some third variable, such as time.

Objective

Given a function, find its inverse relation, and tell whether the inverse relation is a function. Graph parametric equations both by hand and on a grapher, and use parametric equations to graph the inverse of a function.

Inverse of a Function Numerically

t (h)	d (mi)
1	0.2
2	0.6
3	1.0
4	1.4
5	1.8
6	2.2
7	2.6
8	3.0

Suppose that the distance d, in miles, a particular highway crew paints in an eight-hour shift is given numerically by this function of t, in hours, it has been on the job.

Let $d = f(t)$. You can see that $f(1) = 0.2, f(2) = 0.6, \ldots, f(8) = 3.0$. The input for function f is the number of hours, and the output is the number of miles.

As long as the crew does not stop painting during the eight-hour shift, the number of hours it has been painting is a function of the distance. Let $t = g(d)$. You can see that $g(0.2) = 1, g(0.6) = 2, \ldots, g(3) = 8$. The input for function g is the number of miles, and the output is the number of hours. The input and output for functions f and g have been *interchanged,* and thus the two functions are *inverses* of each other.